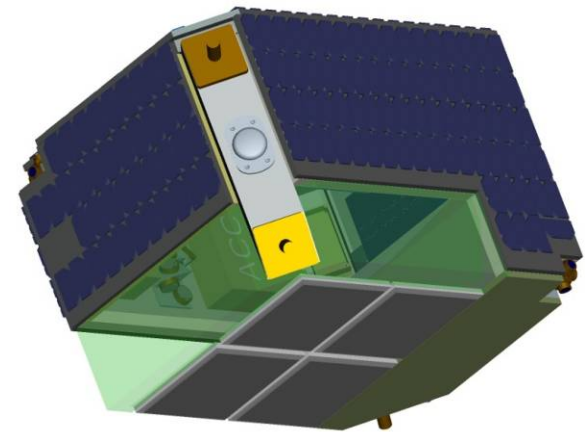


COM DEV AIS Initiative



TEXAS II Meeting
September 03, 2008
Ian D'Souza



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AIS from Space – The Challenge

Some important technical questions:

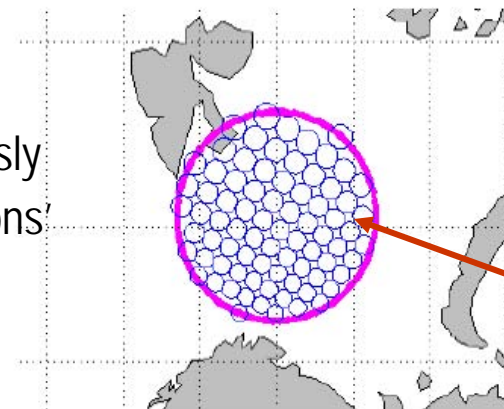
Is the AIS signal strength seen from space enough?

- System, and ship transmitters/antennas designed for local terrestrial communication only



Field of view from space is large:

- Many SOTDMA cells will be in view simultaneously
- Signals from different cells will overlap - 'Collisions'



Typical
satellite field
of view

Many
SOTDMA cells



COM DEV Systematic Approach to Problem

- Simulations show high probability of detection using COM DEV's receiver for capture of large numbers of ships
- This has been verified in ground, aircraft and now space trial
- The measured data shows that the performance of the COM DEV receiver is superior to a standard commercial receiver.

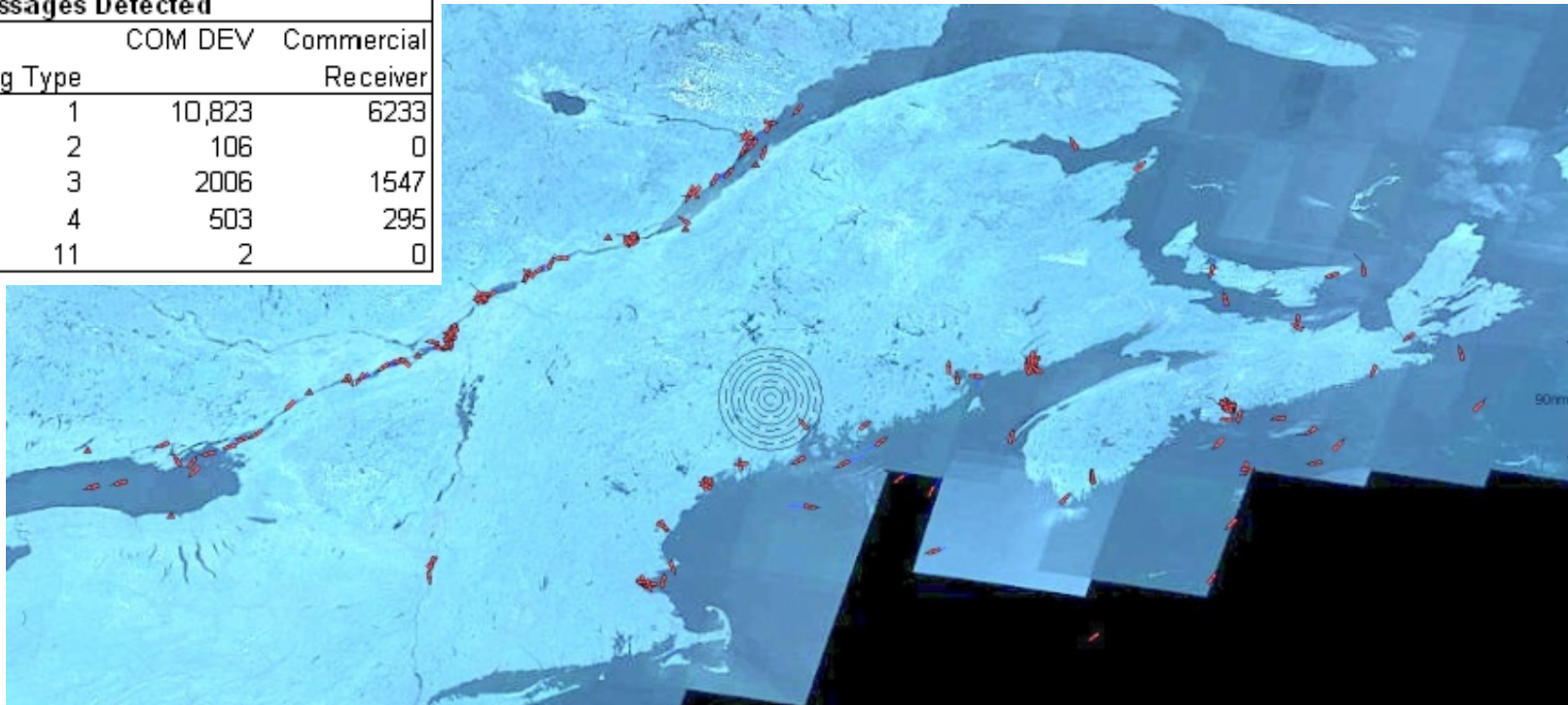




Flight from Ottawa to Halifax

The red dots are ships detected (220)

Messages Detected		
Msg Type	COM DEV	Commercial Receiver
1	10,823	6233
2	106	0
3	2006	1547
4	503	295
11	2	0



Field of view: 600 km diameter from FL280, Data taken Dec 4, after major snow-storm
COM DEV system already shown to be approx twice as sensitive as the commercial AIS receiver on this flight (despite low altitude, small footprint, few collisions).



Nano-satellite Tracking of Ships

Designed to be launched *quickly*, to perform key *validation* of COM DEV AIS radio technology:

- verify ability to get AIS messages
- understand the noise environment
- get insight into global ship traffic density and distribution
- compare performance against commercial AIS receivers, validate the simulations

NTS was not designed to provide an operational capability

- 7 months from kick-off to launch
 - Use available bus design: restrict bus design changes to minimum to meet schedule
 - scaled-back payload design, minimum to verify concepts
- Focussed mission objectives
 - Take several 85 s snapshots globally. Two to four-days snapshot download, limited by on-board memory, bus data link

Project kick-off in September 2007, Launched on 28th April 2008

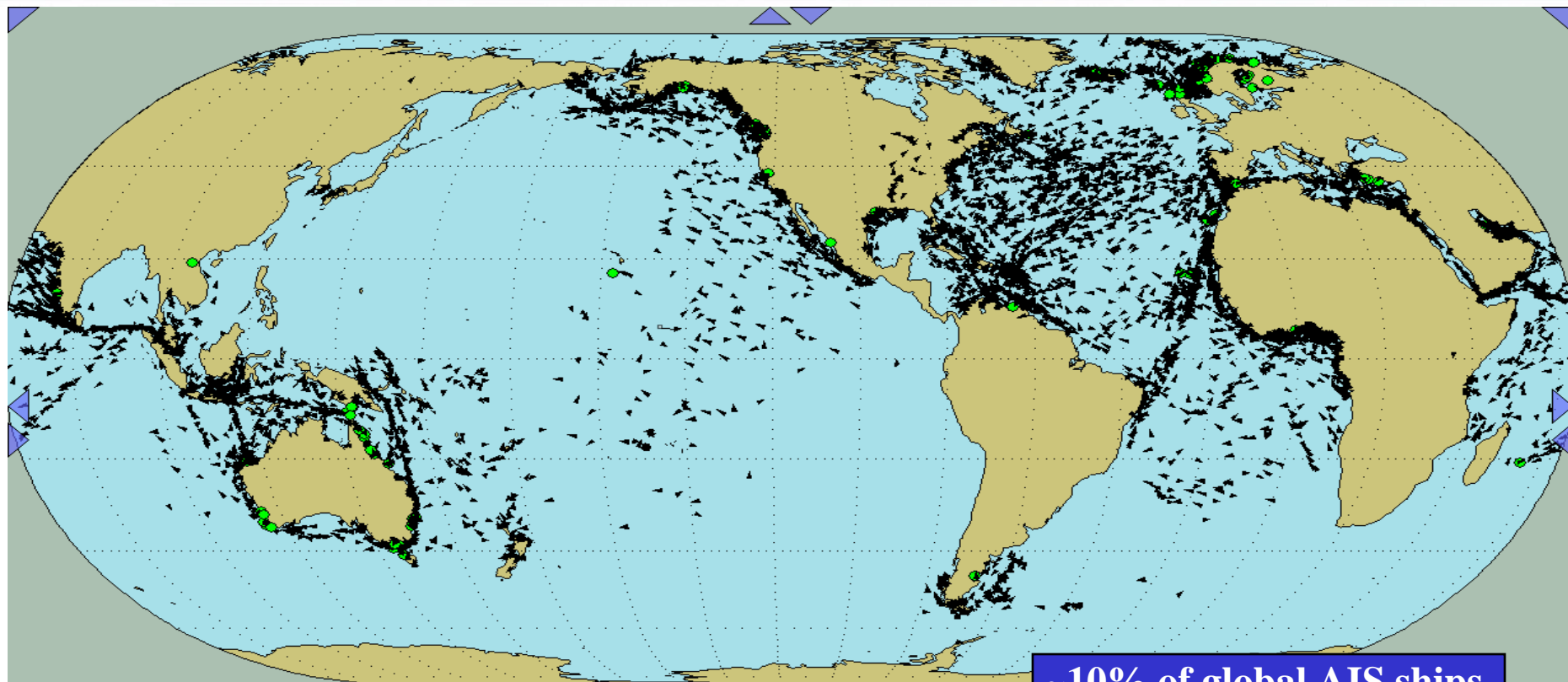
COM DEV nano-Satellite: NTS



NTS integrated on PSLV C9
upper stage



NTS – World's First Demonstration of Advanced AIS detection from Space

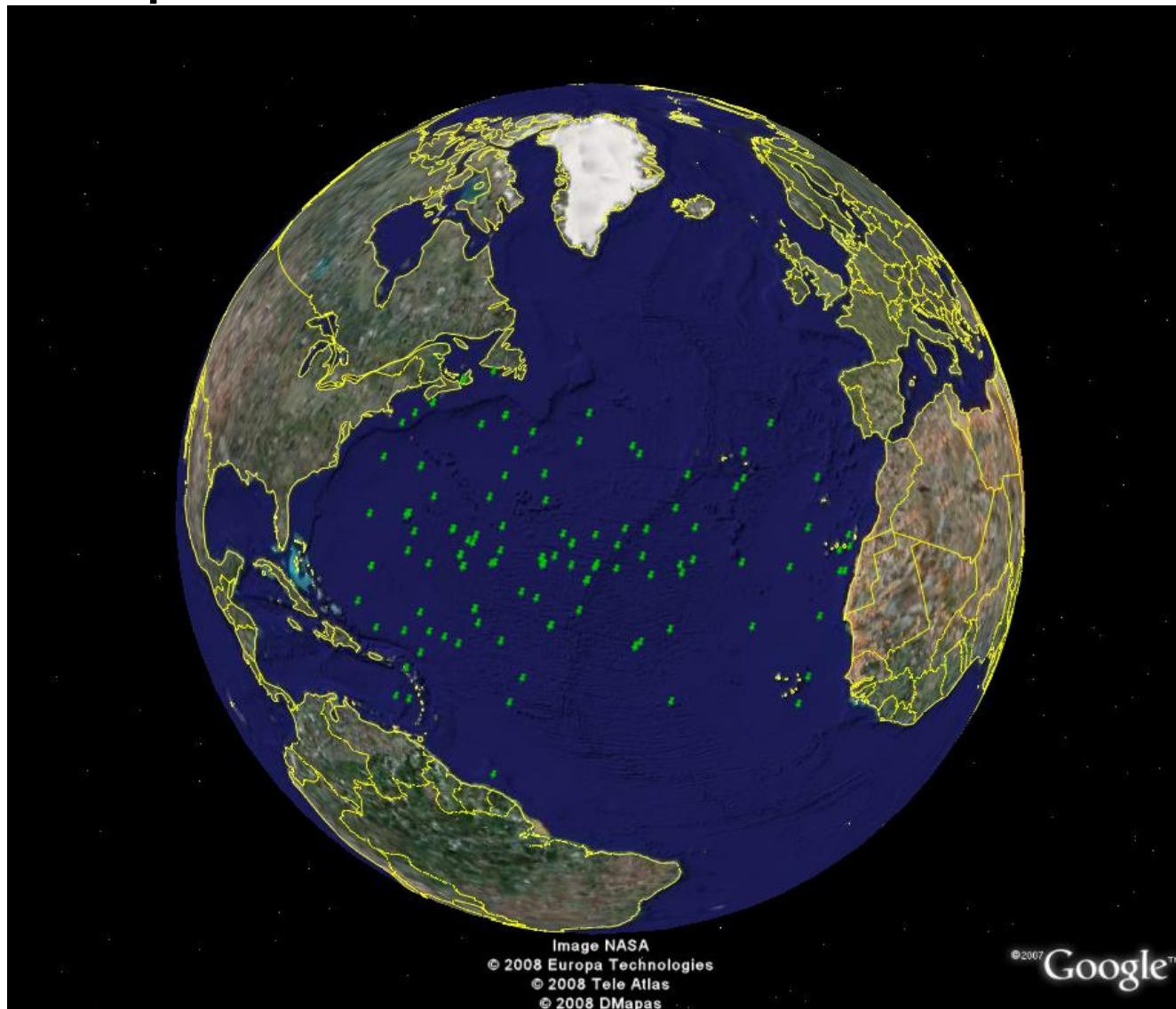


Latest global snapshot

**~10% of global AIS ships
from 135 Flag States
in 1700 seconds**

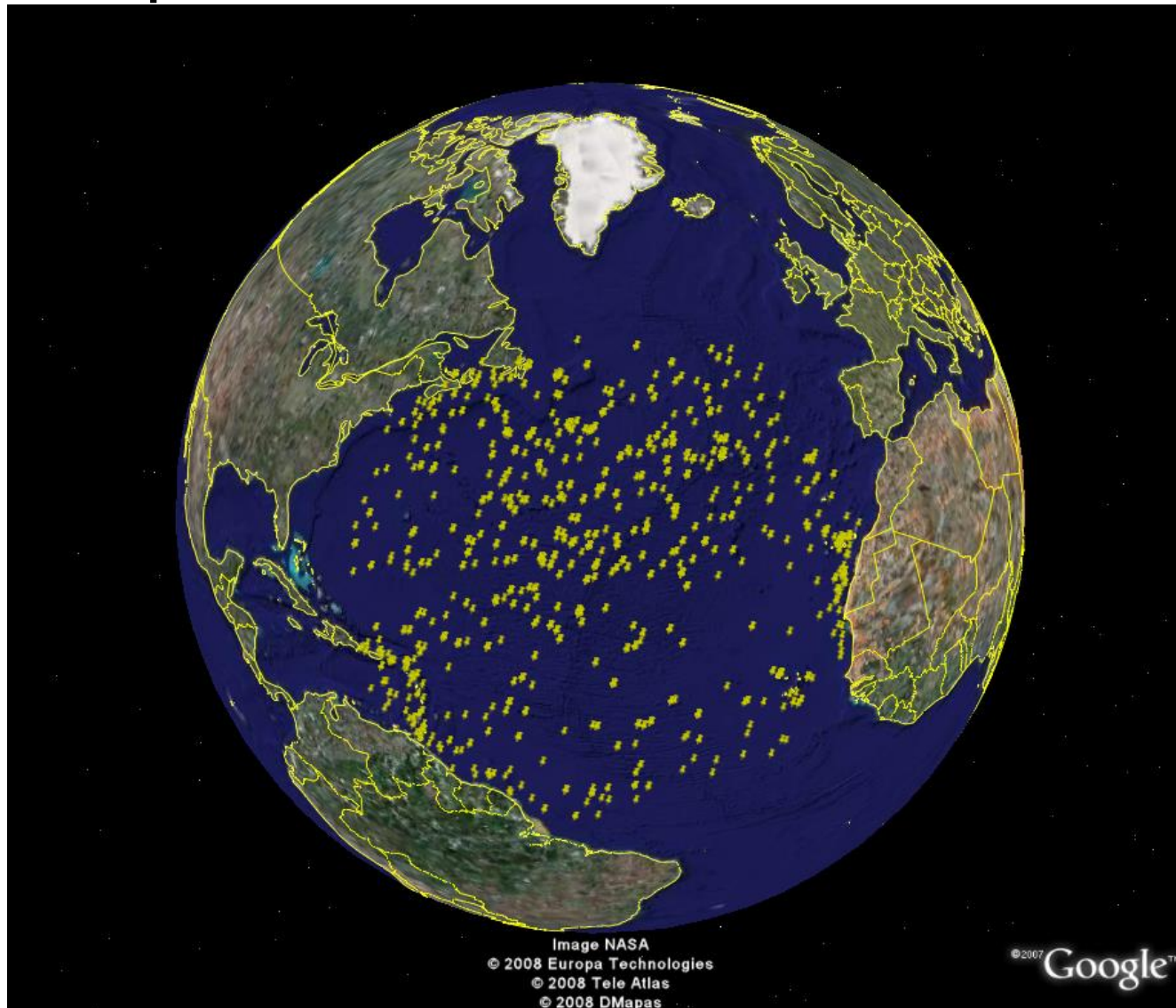
21,635 AIS messages (in 20 snapshots ~85 seconds each) detected 13 msg/s.
6976 class A ships, 30 class B ships, 94 base stations and 1 search and rescue aircraft

Comparison: Commercial Rx vs COM DEV Rx



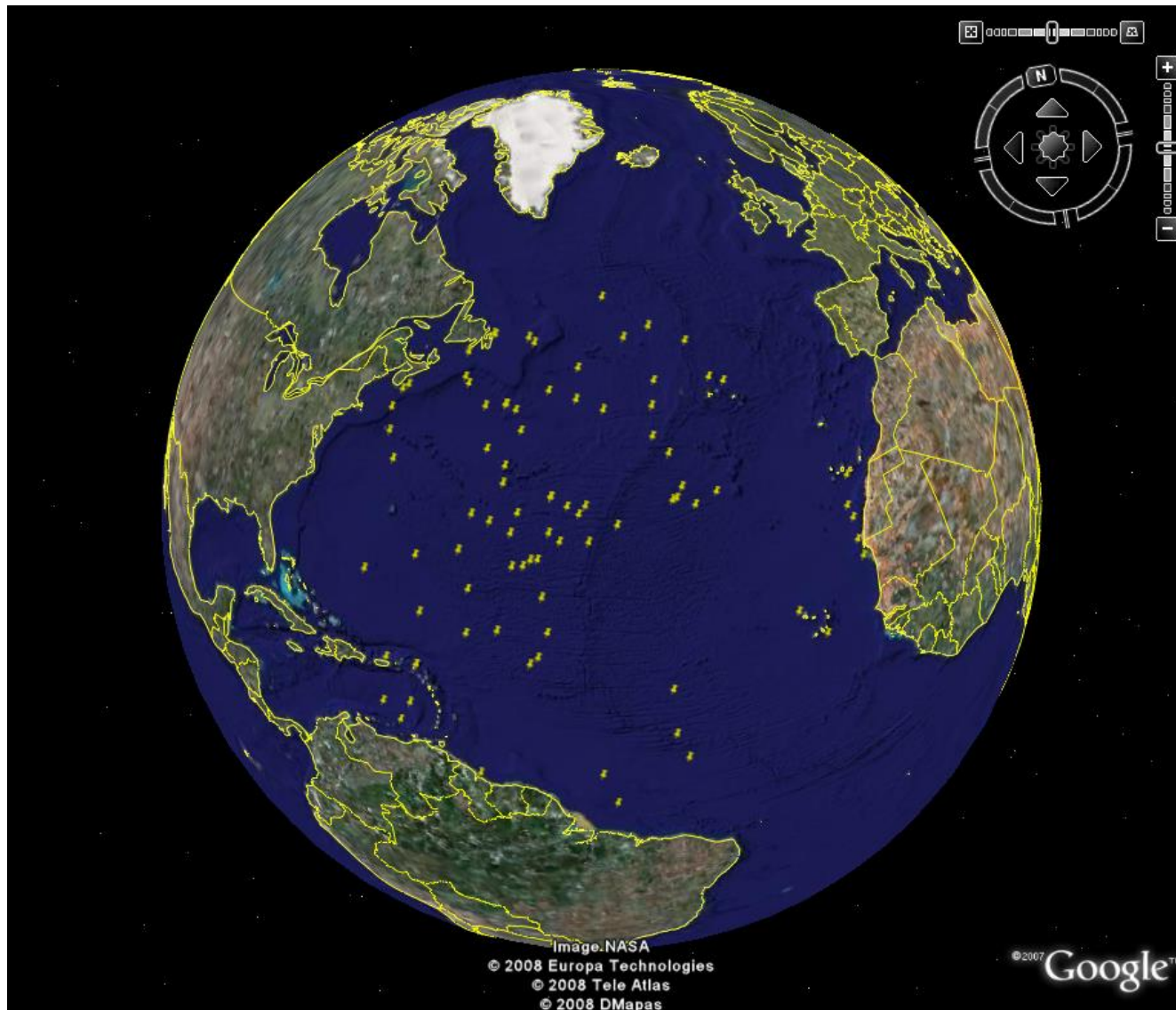
50 seconds of AIS
messages from
Commercial Receiver
when NTS data
replayed through it

Comparison: Commercial Rx vs COM DEV Rx

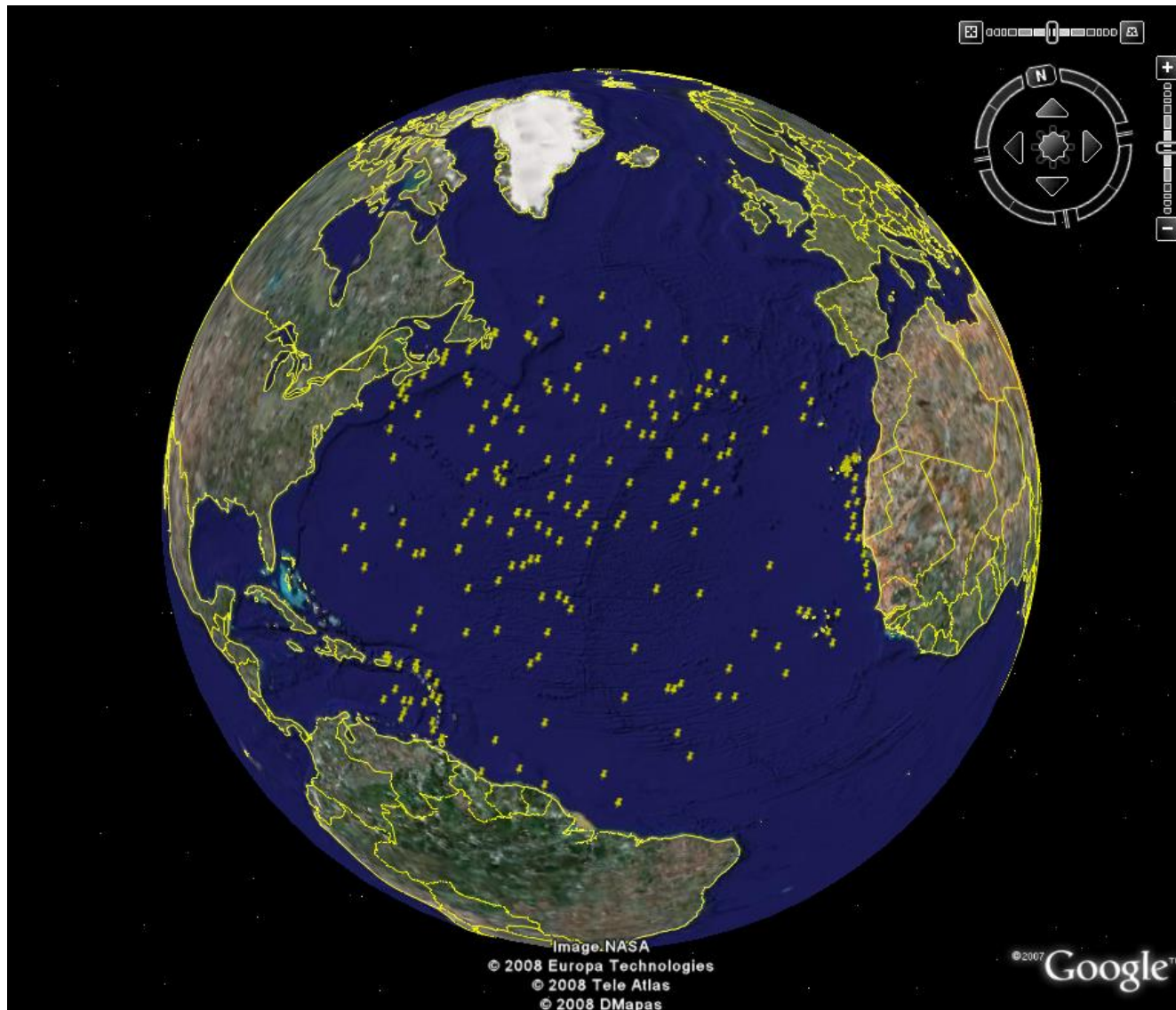


Identical 50 seconds
of data from COM
DEV approach

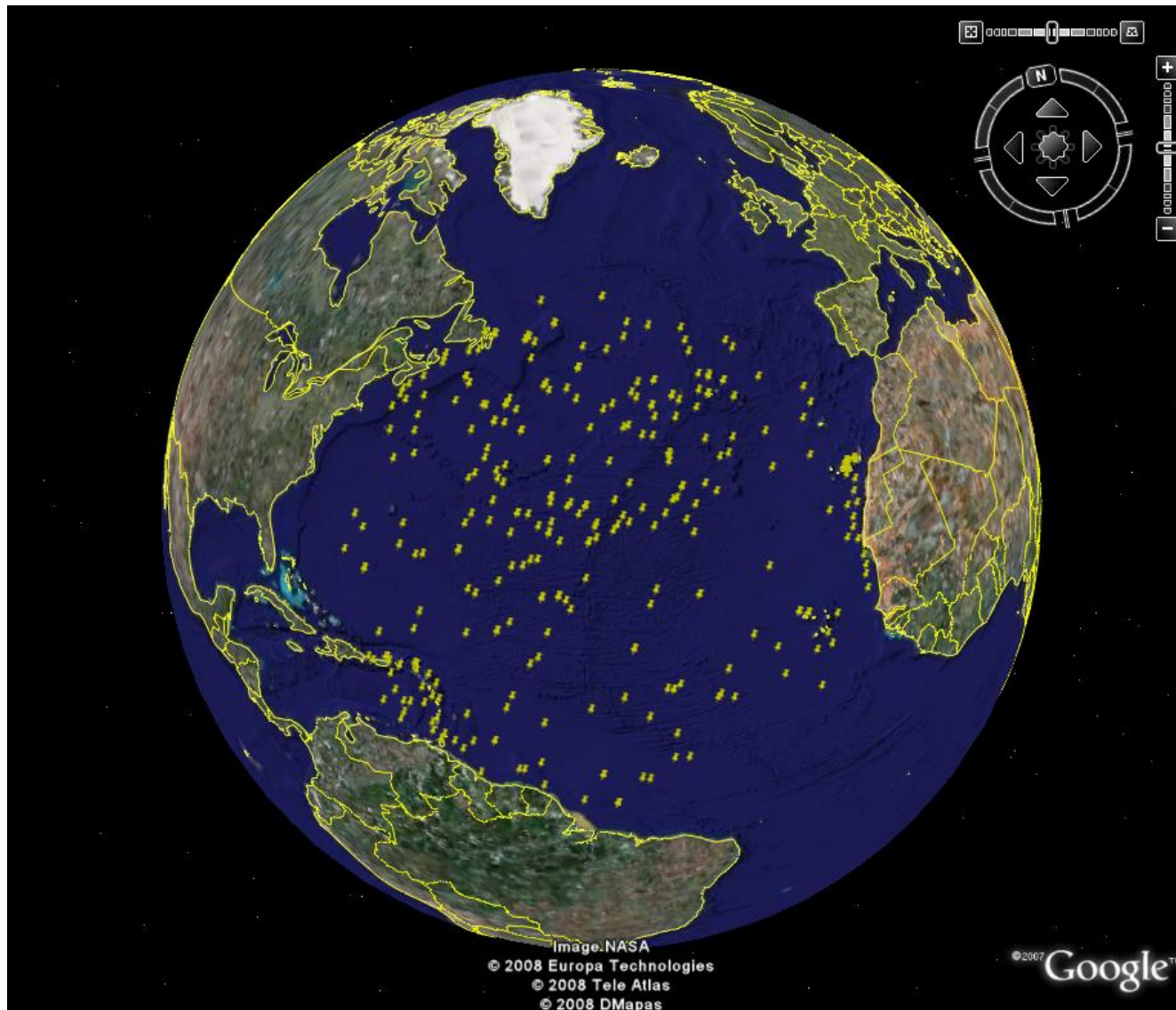
Mid-Atlantic Data (3 s observation time)

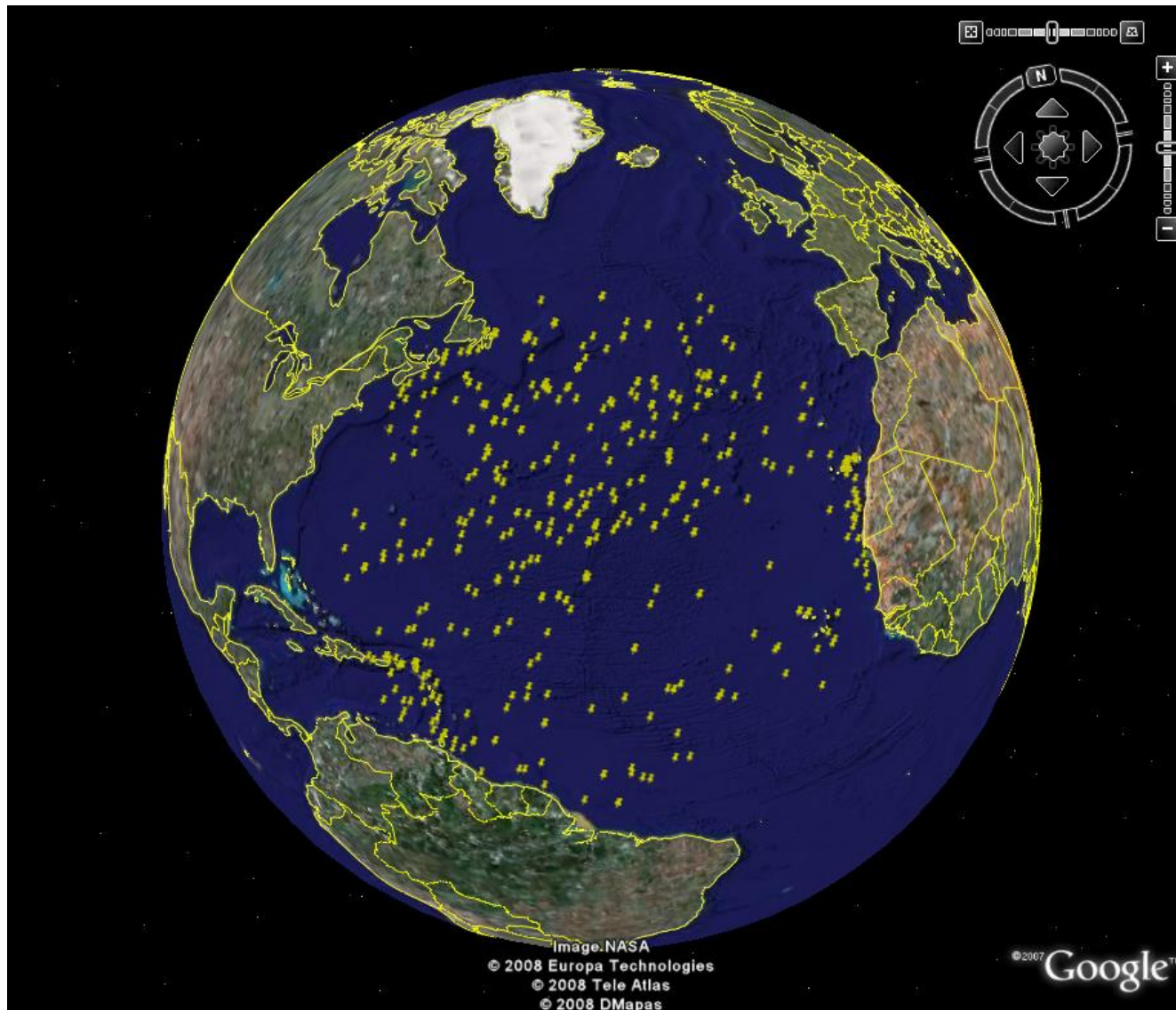


Mid-Atlantic Data (9 s observation time)

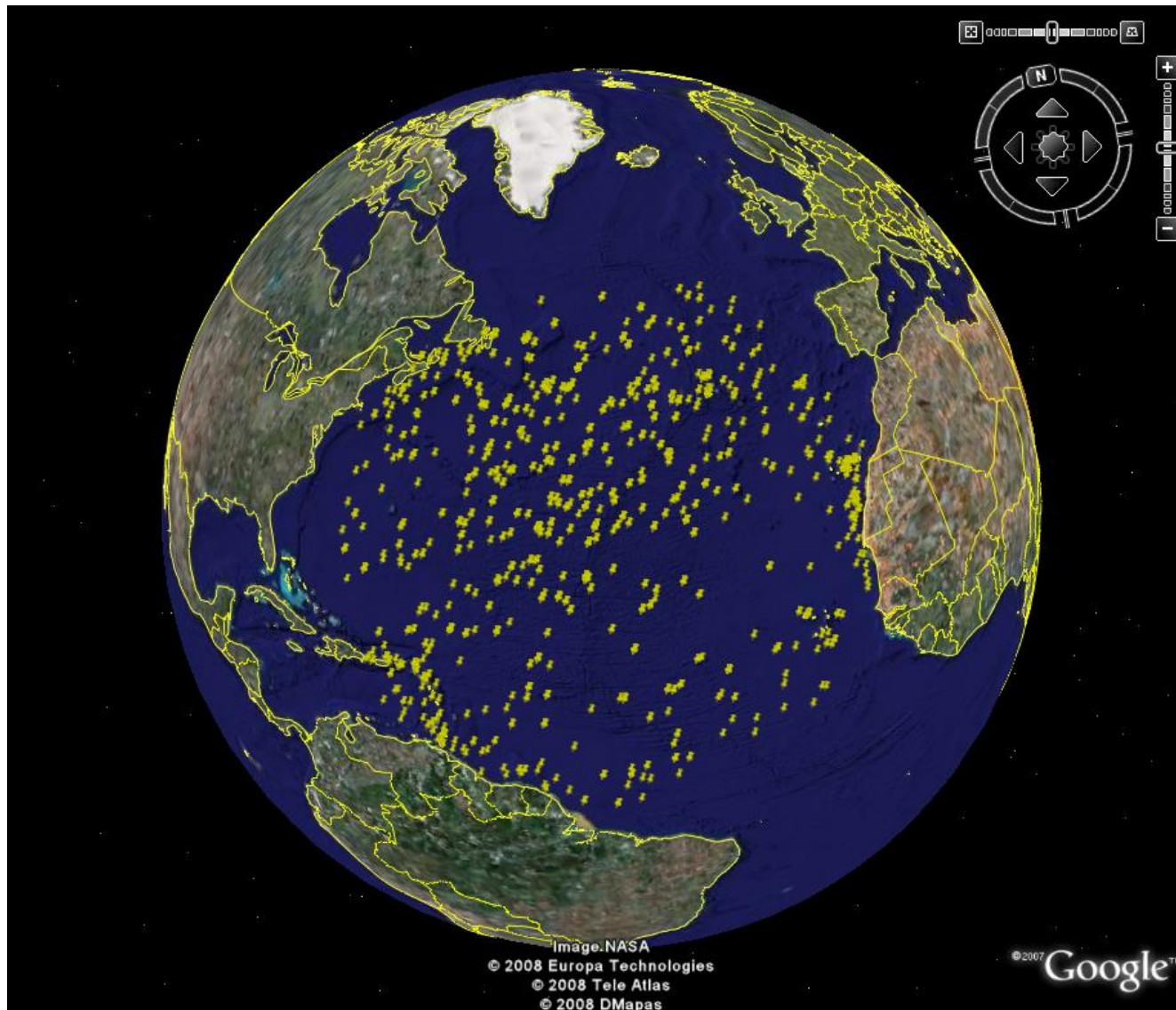


Mid-Atlantic Data (15 s observation time)

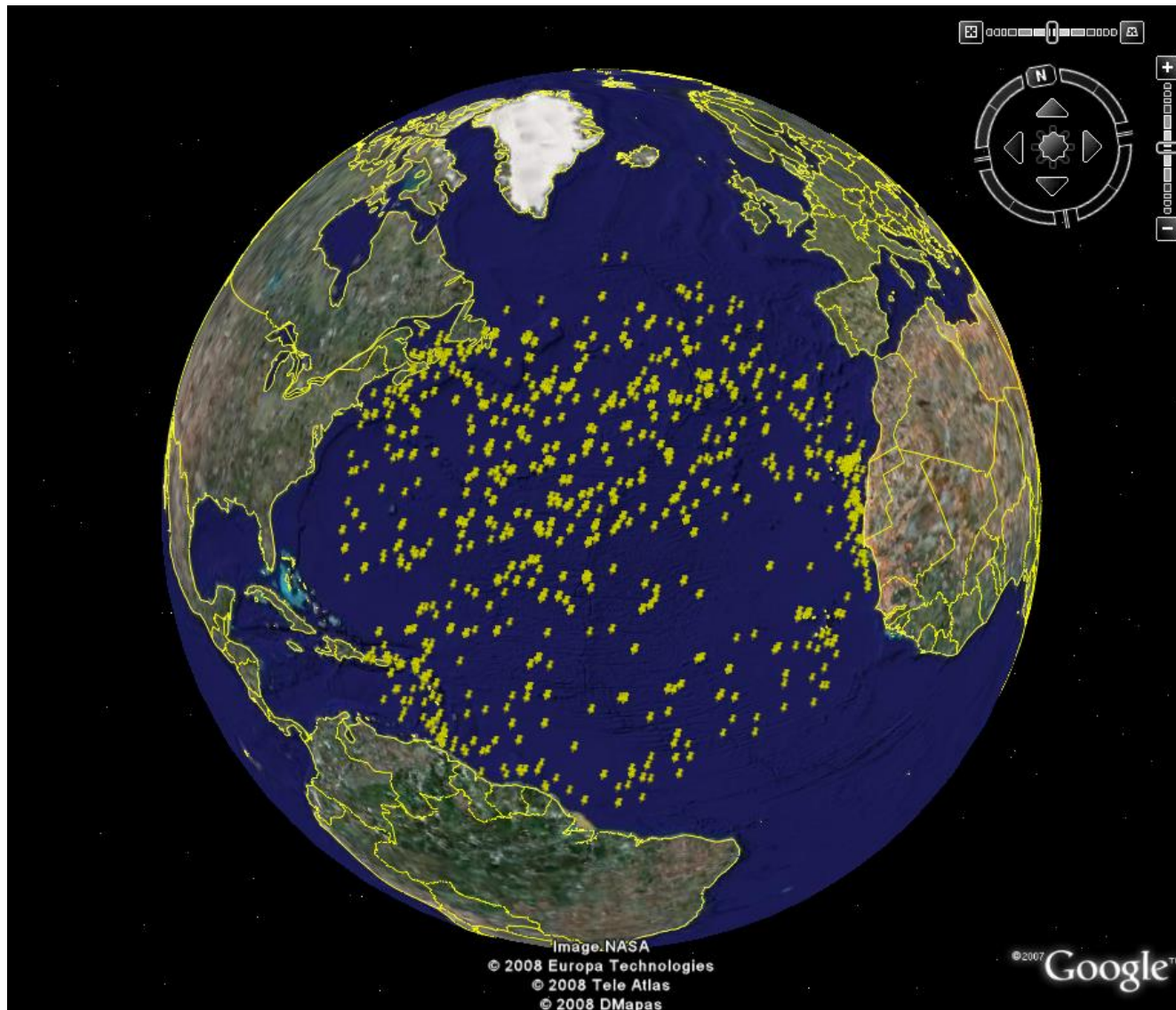




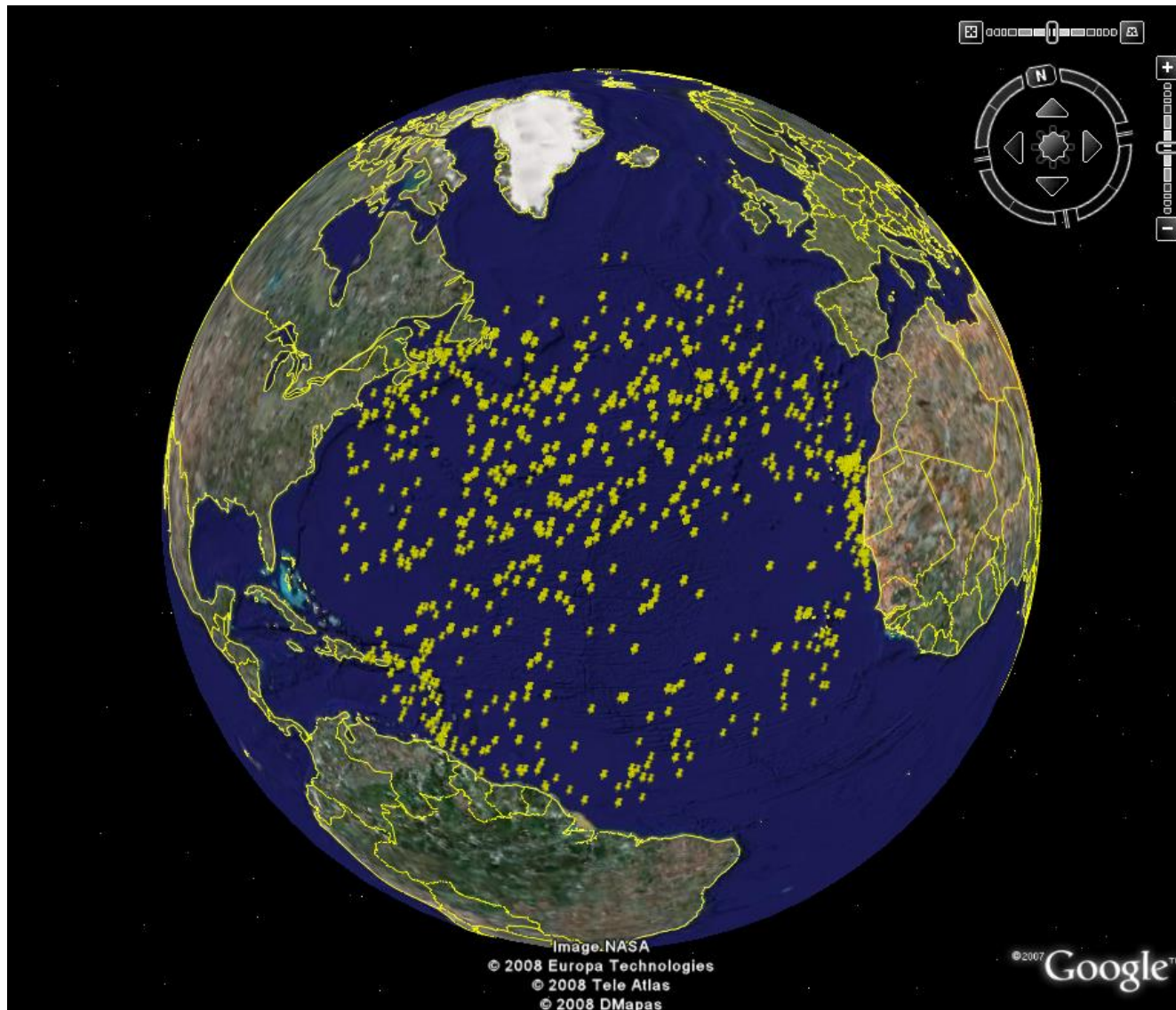
Mid-Atlantic Data (50 s observation time)



Mid-Atlantic Data (72 s observation time)



Mid-Atlantic Data (86 s observation time)



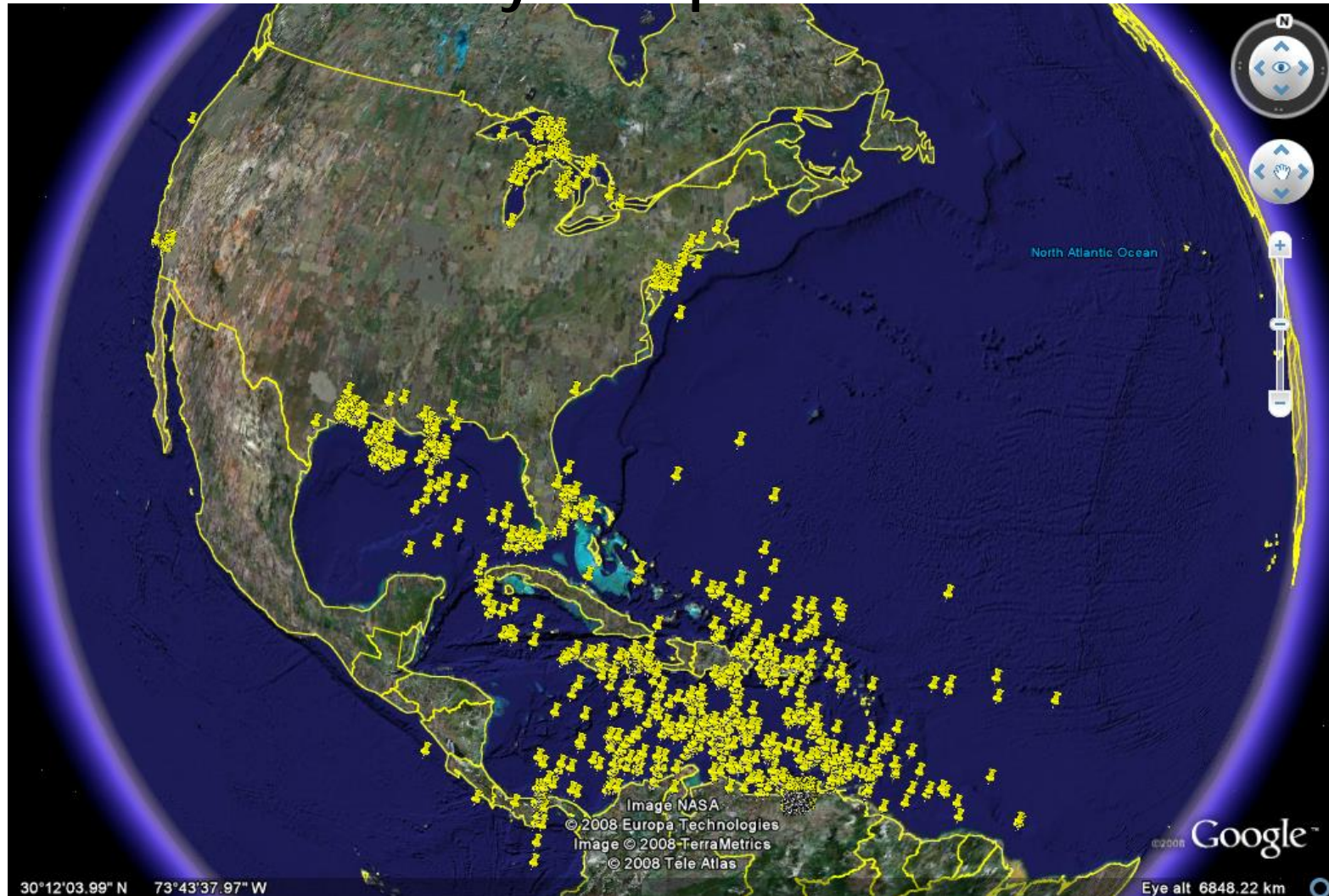


Movie

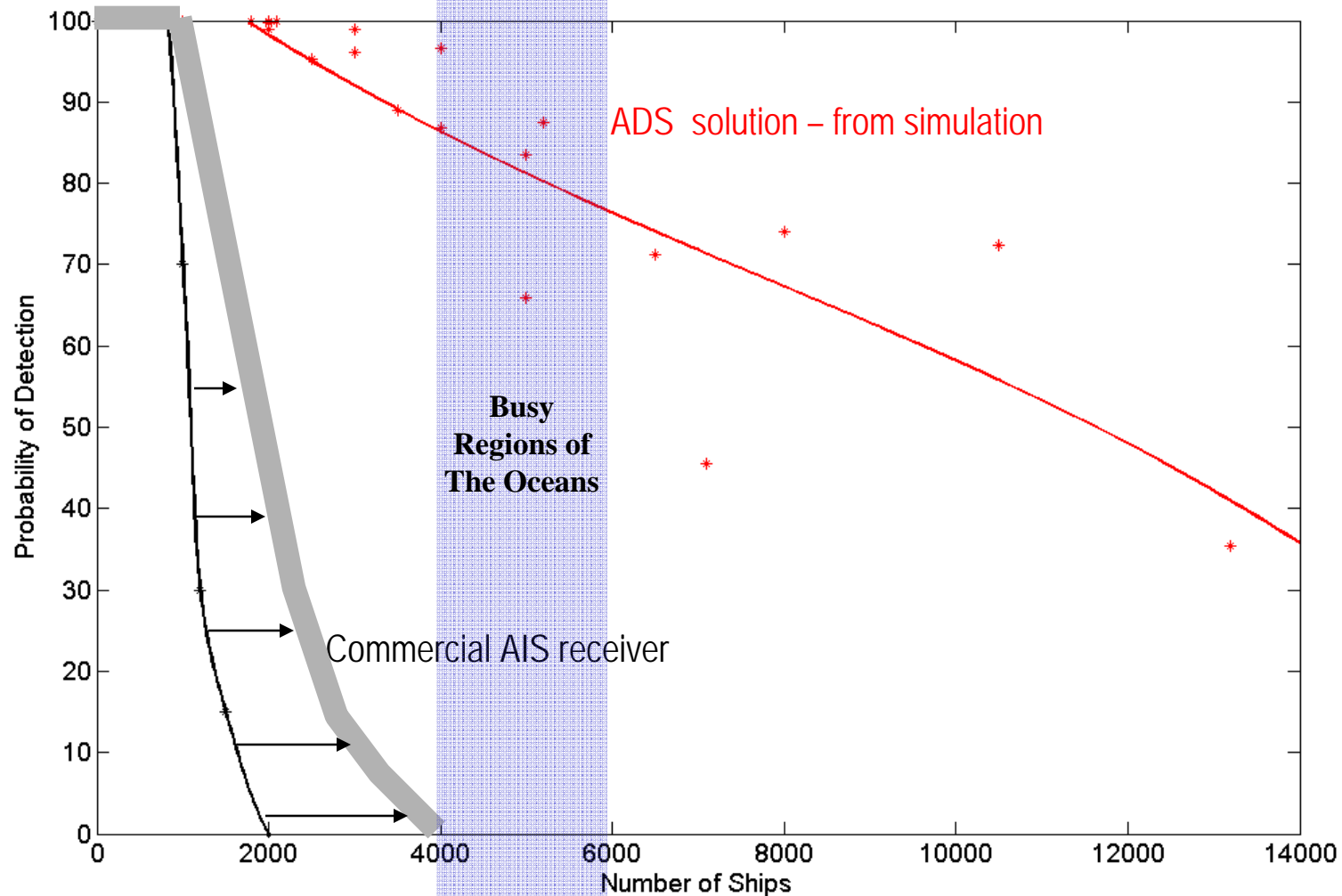




Simulation of full system performance

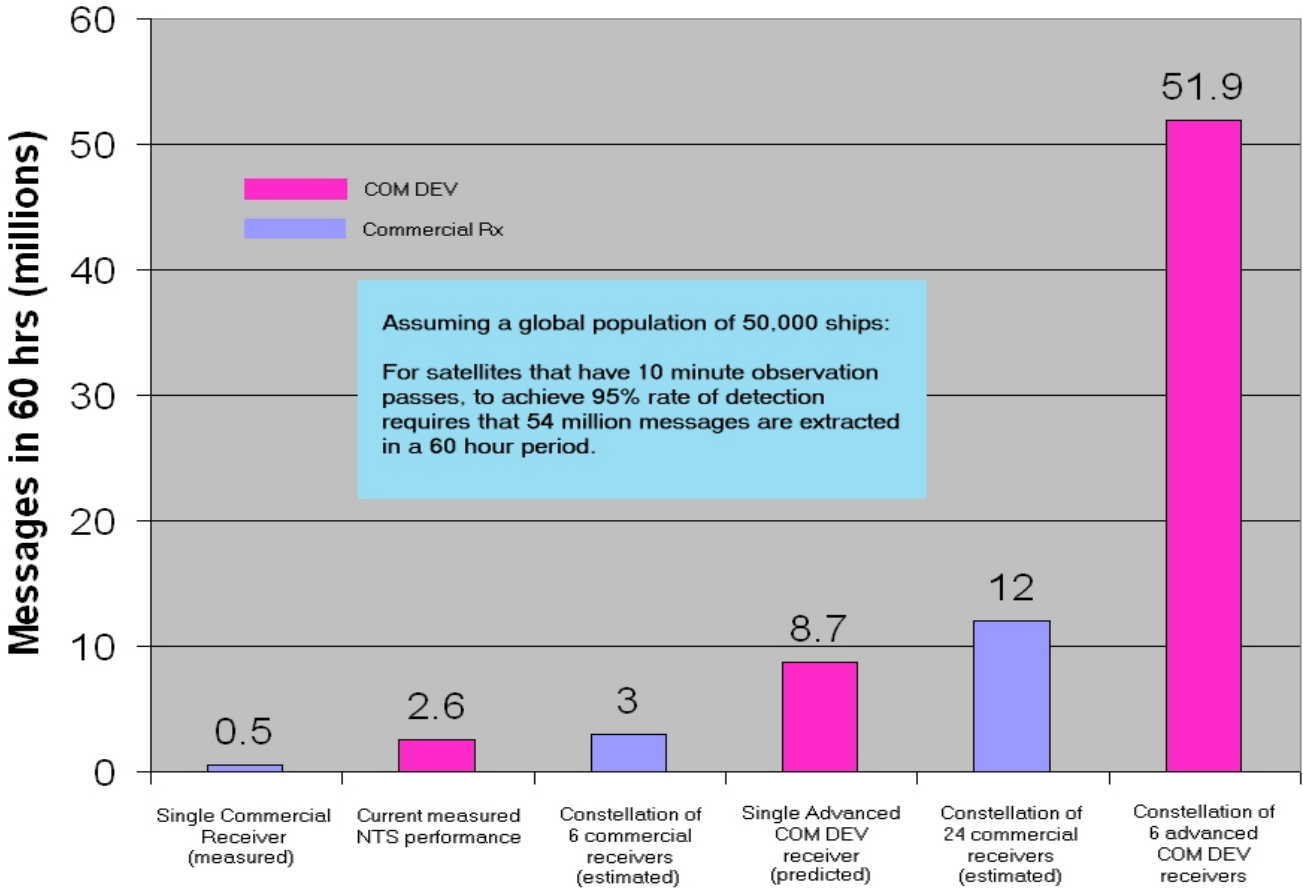


Comparison of performance of a single receiver over an observation pass of 10 minutes



For a 95% detection rate of an active global AIS Class A population of 50,000 ships over 10 minutes implies that 54,000,000 messages are being detected in a 60 hour period

Comparison With Commercial Receiver





Conclusions

- AIS detection from space is viable
- High detection rates for ships can only be accomplished using smart AIS receiving capability